

Project Baseline Summary Report

Data Source: **EM CDB**

Operations/Field Office: **Savannah River**

Site Summary Level: **Savannah River Site**

Project **SR-SW01 / Consolidated Incinerator Facility**

Report Number: **GEN-01b**

Print Date: **3/9/2000**

HQ ID: **0044**

General Project Information

Project Description Narratives

Purpose, Scope, and Technical Approach:

THE SCOPE OF WORK DESCRIBED IN THIS PROJECT IS WRITTEN FOR FUNDING AT THE PLANNING LEVEL.

Purpose:

CIF incinerates solid and liquid wastes that are either hazardous, low level radioactive (LLW), or mixed, reducing both the legacy waste inventory and the volume of newly generated waste for disposal.

The Site Treatment Plan (STP), a formal agreement with regulators regarding the treatment schedule for legacy wastes, commits SRS to a fixed schedule to treat the waste streams identified in the plan. CIF is the treatment facility for the following STP commitments: treat 50% of the non-PUREX legacy mixed waste by Q4 FY98, treat the remaining 50% of the non-PUREX legacy mixed waste 30 months after a pre-treatment agreement with SCDHEC has been reached and a pre-treatment contract has been placed, treat 50% of the PUREX legacy mixed waste by Q4 FY09, and treat the remaining 50% of the PUREX legacy mixed waste by Q4 FY19.

CIF significantly reduces the lifecycle costs associated with the disposal of LLW via volume reduction. CIF is able to reduce the volume of LLW by up to a factor of 30, which greatly extends the life of the costly vault disposal facilities. Furthermore, since CIF is able to co-process LLW in parallel with the mixed waste being treated, the additional cost of treating LLW at CIF is low.

CIF can treat benzene waste generated from DWPF and the salt solution treatment process by direct transfer of waste to CIF's secondary combustion chamber (SCC).

Other waste streams that can be treated at CIF include waste oils from transportation and heavy equipment operations, aqueous and organic wastes from demonstration projects and laboratory operations, and job control wastes from clean up and remediation activities.

Definition of Scope:

CIF will meet the site's STP commitments, burn all incinerable newly generated LLW, and treat numerous other wastes generated at SRS.

CIF will treat approximately 3 million pounds of waste per year until FY19 as follows:

Solvent from NSST , , 1.75 million pounds

LLW , , , 0.25 million pounds

Benzene waste (if applicable), 0.25 million pounds

Miscellaneous liquid wastes , 0.75 million pounds

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After FY2019 the CIF will continue to burn mixed waste and newly generated Low Level Waste until End State is reached which is estimated at FY2030. For Details of the Waste Streams, see the AVS System's Reports.

Technical Approach:

CIF uses incineration to destroy organic hazardous components and reduce waste volumes. Under current operating parameters, 99.99% destruction of hazardous organic constituents is achieved. Volume reduction is typically 200:1 (99.5%) for liquids and 28:1 (96%) for solids. For many of the waste streams that CIF treats, incineration is the best demonstrated available technology.

CIF treats solids packaged in 21" boxes which are conveyor fed into the kiln. Liquid wastes are fed directly from storage tanks in the CIF tank farm or from the New Solvent Storage Tanks (NSST) facility. Liquids are received into the tank farm from either carboys or conventional road tankers. Incineration is tightly controlled to ensure adequate destruction of the hazardous constituents and to ensure that emissions are within established limits. Initial combustion takes place at temperatures above 1,400 °F, with the resultant off gas sent to the SCC where higher temperatures are used to maximize destructive efficiency. Liquid feeds and supplementary fuel oil are atomized with steam to facilitate combustion.

CIF generates four secondary waste streams: ash from the rotary kiln, blowdown liquids from the off-gas system, incinerable job control waste, and non-incinerable wastes. Incinerable job control waste is treated at the CIF facility directly as an additional feed. The ash and blowdown liquids are stabilized to meet LDR requirements for disposal. All wastes are disposed of in accordance with applicable regulations.

Technology Needs:

CIF treatment capacity is limited by the generation of secondary waste blowdown. SR99-1011 identifies a need for an evaporator to reduce the volume of blowdown waste while preventing excessive system fouling and foaming. The estimated annual cost savings is \$1.2 M.

Operating experience shows HEPA filter change-out is required every two weeks. SR99-1023 identifies a need for an improved off-gas cleaning system to significantly extend the filter operating life. The annual operating cost of HEPA filter change-outs is \$500,000.

SR99-1021 identifies a need to determine the dioxin and furan formation mechanism at CIF and develop technology to reduce their emissions per the EPA MACT regulations.

SR99-1018 identifies a need to identify various technologies for mercury removal, and deploy the best system in the CIF off-gas system per the proposed EPA MACT emission standard

SR99-1022 identifies a need for an improved ash removal and stabilization process. A new system will significantly reduce operating costs and allow full utilization of the plant design capability, resulting in estimated annual cost savings of \$400,000- \$800,000.

Continuous emissions monitoring (CEM) of emissions is desirable for regulatory compliance, improved process control, and increased public

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confidence in incineration. Current CEM technologies are unable to successfully measure the pollutants at the very low concentrations occurring in the stack gas. SR99-1004 identifies a need to identify, develop, and demonstrate technologies that could be used for more accurate CEM of hazardous compounds in the stack gas.

Hydraulic conductivity measurements are required to determine waste form leachability for compliance with SRS disposal requirements. Performing these measurements are difficult, time consuming, and costly. SR99-1019-S identifies a need to determine another physical characteristic of radioactive cement-based waste forms that could be used to predict hydraulic conductivity.

Project Status in FY 2006:

CIF met one of its STP commitments (Q4 FY98) and will be close to meeting another (50% PUREX by Q4 FY09). Approximately 40% of the legacy PUREX waste will have been treated. CIF will have incinerated approximately 24.5 million pounds of waste, since radioactive start-up. CIF will be routinely treating LLW at a rate consistent with the generation rate of LLW at SRS.

Post-2006 Project Scope:

CIF will continue to treat PUREX solvent, LLW and other newly generated wastes at around 3 million pounds per year. Incineration of any benzene waste from HLW salt solution treatment will have commenced. After FY2019 the CIF will continue to burn mixed waste and newly generated Low Level Waste until End State is reached which is estimated at FY2030. For Details of the Waste Streams, see the AVS System's Reports.

Project End State

Project End State will occur when waste streams identified in the STP have been processed through CIF. SRS will no longer have a legacy of either hazardous, mixed, or LLW waste that could be treated by incineration. The current forecast for treating the final wastes is FY2030. When CIF has completed its mission, it will be turned over to the Facility Deactivation Division for final closure. Deactivation and disposition of ETF will be carried out in accordance with PBS FA-25.

Cost Baseline Comments:

The scope assumes CIF will be fully operational during FY2000 and beyond. Operating budgets remain tied to FY1999 levels with minor attrition in the exempt ranks factored in. Variations from year to year are due to (1) periodic subcontracts such as Air Quality, Trial Burn, and MACT Performance Tests, (2) capital project requirements, and (3) risk assessments.

Safety & Health Hazards:

The CIF is classified as a Radiological/Low Hazard facility (see the Hazards Assessment Document WSRC-TR-93-071). The Auditable Safety Analysis (WSRC-TR-96-0212) addresses design basis accidents, safety criteria, waste management, safety protection systems, risk reduction programs, analysis of operations, and process requirements applicable to the facility. The most credible events identified were Explosion, Fire, Low Energy Liquid Release, Earthquakes and High Velocity Straight Wind. Administrative controls, engineering controls and extensive operator training will reduce the probability of occurrence and aid in the mitigation of design bases accidents.

Safety & Health Work Performance:

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All work is performed using a WSRC Integrated Safety Management System (ISMS) approach. The ISMS integrates safety considerations into management and work practices at all levels to accomplish missions while protecting the public, the worker, and the environment. The key elements of the WSRC ISMS are to define the scope of work, identify and analyze hazards associated with the work, develop and implement hazard controls, perform work within controls, and provide feedback on adequacy of controls and continue to improve safety management. The WSRC Integrated Procedures Management System is the primary mechanism for implementing the objective, principles and functions of the ISMS. This system establishes Company-Level, Division-level, and Program-specific procedures consistent with organizational roles, and ensures a consistent, disciplined site-wide approach to safety while performing work.

PBS Comments:

CIF is required to comply with state and federal regulations governing the treatment of mixed waste streams, while achieving its waste management mission. CIF support to SRS adds a new waste management dimension through waste volume reduction and destruction, rather than adding to legacy waste storage. The CIF allows other site facilities (DWPF, H and F Canyons, and site mixed waste generating facilities) to continue to meet the waste reduction objectives of the DOE complex.

Baseline Validation Narrative:

General PBS Information

Project Validated?

Date Validated:

Has Headquarters reviewed and approved project?

No

Date Project was Added: 12/1/1997

Baseline Submission Date: 7/3/1999

FEDPLAN Project? Yes

Drivers:	CERCLA	RCRA	DNFSB	AEA	UMTRCA	State	DOE Orders	Other
	N	Y	N	N	N	Y	Y	Y

Project Identification Information

DOE Project Manager: H. Gnann

DOE Project Manager Phone Number: 803-208-6076

DOE Project Manager Fax Number: 803-208-7414

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General PBS Information

DOE Project Manager e-mail address: howard.gnann@srs.gov

Is this a High Visibility Project (Y/N):

Planning Section

Baseline Costs (in thousands of dollars)

	1997-2006 Total	2007-2070 Total	1997-2070 Total	1997	Actual 1997	1998	Actual 1998	1999	2000	2001	2002	2003	2004	2005	2006	
PBS Baseline (current year dollars)	301,744	1,104,412	1,406,156	31,555	31,555	23,841	23,841	23,255	26,045	18,238	34,380	35,700	36,569	36,085	36,076	
PBS Baseline (constant 1999 dollars)	274,606	639,074	913,680	31,555	31,555	23,841	23,841	23,255	25,140	16,993	31,190	31,536	31,454	30,222	29,420	
PBS EM Baseline (current year dollars)	301,744	1,104,412	1,406,156	31,555	31,555	23,841	23,841	23,255	26,045	18,238	34,380	35,700	36,569	36,085	36,076	
PBS EM Baseline (constant 1999 dollars)	274,606	639,074	913,680	31,555	31,555	23,841	23,841	23,255	25,140	16,993	31,190	31,536	31,454	30,222	29,420	
	2007	2008	2009	2010	2011- 2015	2016- 2020	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2051- 2055	2056- 2060	2061- 2065	2066- 2070
PBS Baseline (current year dollars)	37,253	36,053	38,328	36,983	195,166	229,281	251,277	280,071	0	0	0	0	0	0	0	0
PBS Baseline (constant 1999 dollars)	29,581	27,876	28,856	27,111	132,174	135,913	130,373	127,190	0	0	0	0	0	0	0	0
PBS EM Baseline (current year dollars)	37,253	36,053	38,328	36,983	195,166	229,281	251,277	280,071	0	0	0	0	0	0	0	0
PBS EM Baseline (constant 1999 dollars)	29,581	27,876	28,856	27,111	132,174	135,913	130,373	127,190	0	0	0	0	0	0	0	0

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Baseline Escalation Rates

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
0.00%	0.00%	0.00%	3.60%	3.60%	2.70%	2.70%	2.70%	2.70%	2.70%	2.70%	2.70%	2.70%
2010	2011-2015	2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2051-2055	2056-2060	2061-2065	2066-2070
2.70%	2.70%	2.70%	2.70%	2.70%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%

Project Reconciliation

Project Completion Date Changes:

Previously Projected End Date of Project: 9/30/2030
Current Projected End Date of Project: 9/30/2030
Explanation of Project Completion Date Difference (if applicable):

Project Cost Estimates (in thousands of dollars)

Previously Estimated Lifecycle Cost (1997 - 2070, 1998 Dollars):	777,862	Actual 1997 Cost:	31,555	Actual 1998 Cost:	23,841
Previously Estimated Lifecycle Cost of Project (1999 - 2070, 1998 Dollars):	722,466	Inflation Adjustment (2.7% to convert 1998 to 1999 dollars):			19,507
Previously Estimated Lifecycle Cost (1999 - 2070, 1999 Dollars):	741,973				

Project Cost Changes

	Cost Adjustments	Reconciliation Narratives
Cost Change Due to Scope Deletions (-):		
Cost Reductions Due to Efficiencies (-):		
Cost Associated with New Scope (+):		
Cost Growth Associated with Scope Previously Reported (+):	1,869	Revised project estimates
Cost Reductions Due to Science & Technology Efficiencies (-):		

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Project Reconciliation

Subtotal:	743,842
Additional Amount to Reconcile (+):	114,442
Current Estimated Lifecycle Cost (1999 - 2070, 1999 Dollars):	858,284

Milestones

Milestone/Activity	Field Milestone Code	Original Date	Baseline Date	Legal Date	Forecast Date	Actual Date	EA	DNFSB	Mgmt. Commit.	Key Decision	Intersite
Project Mission Complete	SR-SW01-007		9/30/2030								
Complete Installation of Replacement Quench Vessel	SR-SW01-002		9/30/2000								
Complete Air Quality Test	SR-SW01-003		9/30/2001								
Treat 50% of the Purex Legacy Mixed Waste	SR-SW01-004		9/30/2009								
Treat the Remaining 50% of the Purex Legacy Mixed Waste	SR-SW01-005		9/30/2019								
Complete CIF Program Activities	SR-SW01-006		9/30/2030								
Project Start	SR-SW01-001		10/1/1996								

Milestones - Part II

Milestone/Activity	Field Milestone Code	Critical Decision	Critical Closure Path	Project Start	Project End	Mission Complete	Tech Risk	Work Scope Risk	Intersite Risk	Cancelled	Milestone Description
Project Mission Complete	SR-SW01-007				Y						
Complete Installation of Replacement Quench Vessel	SR-SW01-002										Complete Installation of Replacement Quench Vessel
Complete Air Quality Test	SR-SW01-003										Complete Air Quality Test
Treat 50% of the Purex Legacy Mixed Waste	SR-SW01-004										Treat 50% of the Purex Legacy Mixed Waste
Treat the Remaining 50% of the Purex Legacy Mixed Waste	SR-SW01-005										Treat the Remaining 50% of the Purex Legacy Mixed Waste

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Milestone/Activity	Field Milestone Code	Critical Decision	Critical Closure Path	Project Start	Project End	Mission Complete	Tech Risk	Work Scope Risk	Intersite Risk	Cancelled	Milestone Description			
Complete CIF Program Activities	SR-SW01-006										Complete CIF Program Activities			
Project Start	SR-SW01-001			Y										

Performance Measure Metrics

Category/Subcategory	Units	1997-2006 Total	2007-2070 Total	1997-2070 Total	Actual Pre-1997	Planned 1997	Actual 1997	Planned 1998	Planned 1999	Planned 2000	Planned 2001	Planned 2002	Planned 2003	Planned 2004
MLLW														
Treatment	M3	1,979.39	3,338.77	5,318.16	0.00		0.00	971.20	8.10	18.40	59.42	44.00	44.40	45.20
MLLW														
Storage	M3							560.70	555.70	491.00	379.00	271.00	163.00	114.10
LLW														
Treatment	M3	7,361.50	9,793.57	17,155.07	0.00		0.00	0.00	1,500.00	1,455.49	820.48	820.47	905.01	625.40
LLW														
Storage	M3							2.20	0.40	0.90	2.80	2.10	2.20	2.20
Tech.														
Deployed	Ntd	2.00	0.00	2.00						2.00				
Category/Subcategory	Units	Planned 2004	Planned 2005	Planned 2006	Planned 2007	Planned 2008	Planned 2009	Planned 2010	Planned 2011 - 2015	Planned 2016 - 2020	Planned 2021 - 2025	Planned 2026 - 2030	Planned 2031 - 2035	
MLLW														
Treatment	M3	45.20	744.27	44.40	44.40	44.40	44.40	462.00	758.30	791.00	765.50	428.77	0.00	
MLLW														
Storage	M3	114.10	408.50	300.50	90.10	84.50	73.67	393.64	400.58	374.62	375.56	282.00	0.00	

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Category/Subcategory	Units	Planned 2004	Planned 2005	Planned 2006	Planned 2007	Planned 2008	Planned 2009	Planned 2010	Planned 2011 - 2015	Planned 2016 - 2020	Planned 2021 - 2025	Planned 2026 - 2030	Planned 2031 - 2035
LLW													
Treatment	M3	625.41	0.00	1,234.64	608.72	604.45	429.02	0.00	2,574.12	2,145.10	2,145.10	1,287.06	
LLW													
Storage	M3	2.20	2.20	2.20	2.20	2.20	2.20	2.20	4.90	4.60	4.60	0.00	0.00
Tech.													
Deployed	Ntd												
Category/Subcategory	Units	Planned 2036 - 2040	Planned 2041 - 2045	Planned 2046 - 2050	Planned 2051 - 2055	Planned 2056 - 2060	Planned 2061 - 2035	Planned 2066 - 2070	Exceptions	Lifecycle Total			
MLLW													
Treatment	M3									6,053.86			
MLLW													
Storage	M3	0.00	0.00	0.00	0.00	0.00	0.00	0.00					
LLW													
Treatment	M3									16,228.07			
LLW													
Storage	M3	0.00	0.00	0.00	0.00	0.00	0.00	0.00					
Tech.													
Deployed	Ntd									2.00			

Technology Needs

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Technology Needs

Site Need Code: SR99-1004

Site Need Name: Need for Continuous Emissions Monitors for Measurement of Hazardous Compound Concentrations in Incinerator Stack Gas

Focus Area Work Package ID: MW-06

Focus Area Work Package: Monitoring and Removing Hazardous and Radioactive Contaminants from Off Gas Streams

Focus Area: MWFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Risk Reduction

Technologies

Development of a Multi-Element Metal CEM/Compliance Monitoring

MIT Multi-Metal Emission Monitor

Surface Acoustic Wave Mercury Vapor Sensor

Cost Savings (in thousands of dollars)

Range of Estimate

Related CCP Milestones

Related Waste Streams

Agree?

Change?

01897: MAH - Listed organic liquid

Y

N

01894: MAE - Listed incinerable debris

Y

N

01896: MAG - Listed aqueous liquid

Y

N

01911: MAB - CIF Ash

Y

N

01898: MAI - Char. organic liquid

Y

N

01895: MAF - Char. incinerable debris

Y

N

00526: LAS - WSF Sort/Seg for CIF

Y

N

00528: LAE - Incinerable Low Activity Job Control Waste

Y

N

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Technology Needs

Site Need Code: SR99-1011

Site Need Name: Demonstrate Evaporation Technologies To Reduce Generation Of Secondary Waste Volume From Consolidated Incineration Facility

Focus Area Work Package ID: MW-04

Focus Area Work Package: Efficient Stabilization of High Metal Content Salts and Ash Waste

Focus Area: MWFA

Agree with Technology Link: N

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Cost Savings (in thousands of dollars)

Range of Estimate

Out of Tank Evaporator

0

Site Need Code: SR99-1018

Site Need Name: Technology To Reduce Mercury Emissions From The Consolidated Incineration Facility

Focus Area Work Package ID: MW-06

Focus Area Work Package: Monitoring and Removing Hazardous and Radioactive Contaminants from Off Gas Streams

Focus Area: MWFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Risk Reduction

Technologies

Cost Savings (in thousands of dollars)

Range of Estimate

Mercury Contamination - Separate and Remove Mercury from Off-gas using a Gold Amalgamation Filter

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Technology Needs

Related CCP Milestones

Related Waste Streams

Agree?

Change?

01897: MAH - Listed organic liquid

Y

N

01894: MAE - Listed incinerable debris

Y

N

01896: MAG - Listed aqueous liquid

Y

N

01911: MAB - CIF Ash

Y

N

01898: MAI - Char. organic liquid

Y

N

01895: MAF - Char. incinerable debris

Y

N

00526: LAS - WSF Sort/Seg for CIF

Y

N

00528: LAE - Incinerable Low Activity Job Control Waste

Y

N

Site Need Code: SR99-1019

Site Need Name: CIF Secondary Waste Form Hydraulic Conductivity Measurements

Focus Area Work Package ID: MW-04

Focus Area Work Package: Efficient Stabilization of High Metal Content Salts and Ash Waste

Focus Area: MWFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Cost Savings (in thousands of dollars)

Range of Estimate

Related CCP Milestones

Related Waste Streams

Agree?

Change?

00529: LAT - CIF Secondary Waste to E Area Trench

Y

N

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Technology Needs

Site Need Code: SR99-1021

Site Need Name: Need to Reduce the Dioxin and Furan Emissions from the CIF

Focus Area Work Package ID: MW-06

Focus Area Work Package: Monitoring and Removing Hazardous and Radioactive Contaminants from Off Gas Streams

Focus Area: MWFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Continuous Emissions Monitor of Dioxins

Cost Savings (in thousands of dollars)

Range of Estimate

0

Related CCP Milestones

Related Waste Streams

Agree?

Change?

02501: -

Y

N

01897: MAH - Listed organic liquid

Y

N

01894: MAE - Listed incinerable debris

Y

N

01911: MAB - CIF Ash

Y

N

01898: MAI - Char. organic liquid

Y

N

01895: MAF - Char. incinerable debris

Y

N

00526: LAS - WSF Sort/Seg for CIF

Y

N

00528: LAE - Incinerable Low Activity Job Control Waste

Y

N

Site Need Code: SR99-1022

Site Need Name: Reliable Ash Removal/Stabilization System for Incinerator Secondary Wastes (Ashout/Ashcrete System)

Focus Area Work Package ID: MW-04

Focus Area Work Package: Efficient Stabilization of High Metal Content Salts and Ash Waste

Focus Area: MWFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Salt and Ash Stabilization - Stabilize Waste using Phosphate Ceramic Process

Cost Savings (in thousands of dollars)

Range of Estimate

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Technology Needs

Developmnet of ICF Stabilization Technologies

Related CCP Milestones

Related Waste Streams

Agree?

Change?

01897: MAH - Listed organic liquid

Y

N

01894: MAE - Listed incinerable debris

Y

N

01896: MAG - Listed aqueous liquid

Y

N

01911: MAB - CIF Ash

Y

N

01898: MAI - Char. organic liquid

Y

N

01895: MAF - Char. incinerable debris

Y

N

00526: LAS - WSF Sort/Seg for CIF

Y

N

00528: LAE - Incinerable Low Activity Job Control Waste

Y

N

Site Need Code: SR99-1023

Site Need Name: High Efficiency Particulate Removal System for a Mixed Waste Incinerator

Focus Area Work Package ID: MW-06

Focus Area Work Package: Monitoring and Removing Hazardous and Radioactive Contaminants from Off Gas Streams

Focus Area: MWFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Cost

Technologies

Cost Savings (in thousands of dollars)

Range of Estimate

Dataset Name: **FY 1999 Planning Data**

Date of Dataset: **9/20/1999**

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Project Baseline Summary Report

Data Source: **EM CDB**

Operations/Field Office: **Savannah River**

Site Summary Level: **Savannah River Site**

Project **SR-SW01 / Consolidated Incinerator Facility**

Report Number: **GEN-01b**

Print Date: **3/9/2000**

HQ ID: **0044**

Technology Needs

Related CCP Milestones

Related Waste Streams

Agree?

Change?

01897: MAH - Listed organic liquid

Y

N

01894: MAE - Listed incinerable debris

Y

N

01896: MAG - Listed aqueous liquid

Y

N

01911: MAB - CIF Ash

Y

N

01898: MAI - Char. organic liquid

Y

N

01895: MAF - Char. incinerable debris

Y

N

00526: LAS - WSF Sort/Seg for CIF

Y

N

00528: LAE - Incinerable Low Activity Job Control Waste

Y

N

Technology Deployments

Deployment Year

Deployment Status

Planned

Forecast

Actual Date

Technology Name: Out of Tank Evaporator

Deployment Commitment 2000

Technology Name: Continuous Emissions Monitors - Measure Dioxin at Stack

Potential Deployment 2000